

GEOLOGY AND SOILS

Many landforms found within the ACEC result from the last period of glaciation. During final glacier recession when the ice mass began to thin, forward movement decreased until the glacier became a stagnant ice bloc. Melting of this bloc then exposed till and bedrock. Streams from the rapidly melting ice flowed through the network of glacial valleys and channels transporting vast amounts of debris. The glacial sediments, with variable texture and composition, were eventually reworked and formed into existing coastal features (USFWS 1992).

The geology in the area includes bedrock outcrops (ledge), glacial till (hardpan soils), glacial outwash (stratified sands and gravel), marine and estuarine deposits (sands, silt, and clay), swamp deposits (organic muck), alluvial deposits (flood plains), and beaches and sand dunes. Marine silts and clays that are now positioned relatively high on the landscape are unique to this coastal area. These sediments were first deposited within a salt-water environment shortly after the glacier receded from the area and were uplifted above present day sea level when the weight of the glacier was removed, allowing the Earth's crust to rebound. Currently, there are 44 different kinds of soils mapped within Northern Essex County; many of these soils are found within the ACEC watersheds (Fletcher per comm 1998).

Plum Island Sound was primarily formed during the last period of glacier advance and retreat. The Sound flows into Ipswich Bay and is bordered on the east by the long, narrow, barrier beach of Plum Island (Figure 2) (Massachusetts Audubon Society 1999). Ipswich and Westbrook soils are the peats found throughout the salt marsh and adjacent brackish wetlands of Plum Island Sound. A high percentage of organic material from decaying estuarine marsh plants compose these two soil compositions. Drumlines (hill-like features composed of glacial debris and sometimes bedrock that form under a flowing glacier) are the most prominent features of the landscape on the mainland side of the Sound (Massachusetts Audubon Society 1999).

Defined as a drowned River Valley, Essex Bay is also a coastal enclosure formed by the large Castle Neck Sand Spit (Figure 2). The spit and dunes consist of fine sand derived from deposits of late glacial marine clays. These deposits underlie the offshore, salt marshes, and coastal lowlands. The South side of Essex Bay consists largely of granite hills, rimmed by salt marsh. Late glacial marine clays underlie the extensive salt marsh areas found on the west side of the bay (Chesmore et al. 1973, Roach 1992).



Figure 2. Aerial photo of Plum Island Sound and Essex Bay

More comprehensive morphometric data and geologic background for Plum Island Sound and Essex Bay can be found can be found in the Division of Marine Fisheries (DMF) Monograph series (DMF 1968, 1973).